



Tomorrow's Elastic
Adaptive Mobility

D4.5.1 Enabler prototypes

WP4.5 - Development of the DIALOGUE applications

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Berlin, 26.03.2015

This project is co-funded
by the European Union



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WP 4.5 Development and Integration of the DIALOGUE Applications



SP4 Apps

Collaborative ACC (C-ACC)

- Harmonizing the cruising speed to impact on safety, fuel consumption, and CO2 emissions

Eco-friendly parking (EFP)

- Help find a car-park close to destination

Collaborative driving and merging (CDM)

- Improve safety and energy efficiency by advising the driver about speed, lane changes and roundabouts

Collaborative Navigation (CONAV)

- Collaborative eco-friendly navigation

Serious Gaming and Community Building (SG-CB)

- Improve the driving performance, in a pleasant and compelling way

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D4.5.1 development of the SP4 enablers



SP4 Enablers

- Modules grouping sets of homogeneous functionalities designed to be used by different applications
- Mostly but non exclusively for SP4 apps
- Development adapted and prioritized according to the needs of the apps under development

D4.5.1 development of the SP4 enablers



SP4 Enablers

- **Cross-SP**
 - User registration
 - User data management
 - User authentication
 - Social networking (gaming)
- **Used by several DIALOGUE apps**
 - HMI proxy
 - HMI device provider
- **Used by a single DIALOGUE app**
 - Green light optimized speed advisor
 - Speed advisor
 - Lane access management
 - Driving safety performance assessment
 - Data ingestion

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Enablers used by a single DIALOGUE app

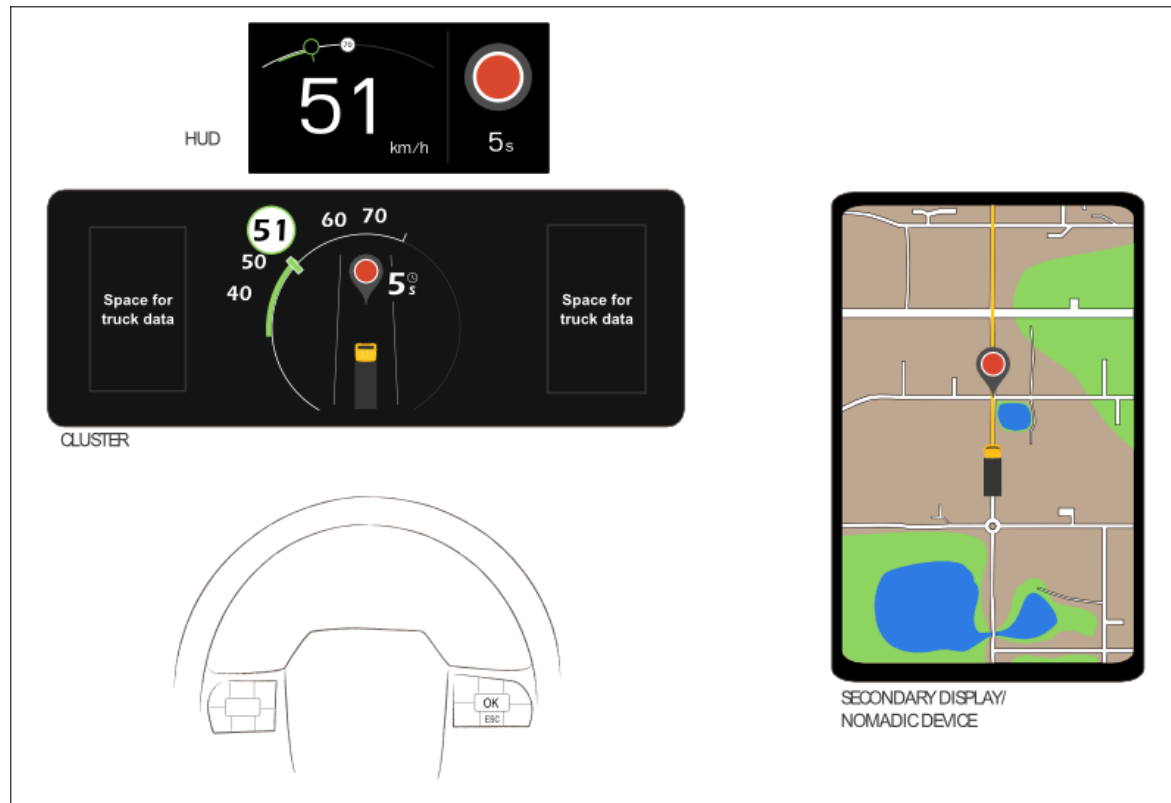
- (1) Green light optimized speed advisor
- (2) Speed advisor
- (3) Lane access management
- (4) Driving safety performance assessment
- (5) Data ingestion

Green light optimized speed advisor

- Based on MAP and SPAT messages received from the roadside infrastructure and the current position of the vehicle, a speed advice is created
- Two levels of APIs in order to offer flexibility to the clients:
 - Calculated speed advice
 - Speed interval
 - Distance to intersection
 - Time to green
 - Direction
 - Object model of decoded ASN.1 messages

SP4 enablers

Green light optimized speed advisor – HMI example



Green light optimized speed advisor – status

- Ready for simulator tests
- Simulator tests remains to be done due to delays in simulator development
- Expected use by the SP4 CDM and C-ACC applications
- Expected use in the Gothenburg, Torino and Berlin test sites

Speed advisor

- Receives speed advice from multiple sources and determines current and upcoming effective speed advice
- The following information is created
 - Relative start distance of speed advice
 - Relative end distance of speed advice
 - Source of speed advice (GLOSA, map data, infrastructure)
 - The speed advice (including lowest speed, if source is GLOSA)
 - Direction in which the speed advice applies

SP4 enablers



Speed advisor – status

- Ready for simulator tests
- Depends on the GLOSA enabler for integration testing
- Expected use by the SP4 CDM and C-ACC applications
- Expected use in the Gothenburg, Torino and Berlin test sites

Lane access management

- Deals with the infrastructure of dedicated lanes, in the context of the SP3 Collaborative Dynamic Corridor application
- Receives MAP-messages from the infrastructure about availability of dedicated lanes.
- Provides an API for requesting access to dedicated lanes and receive results of the requests
- The request is evaluated by the infrastructure (SP3 CDC) based on the regulations set up by the road administrator

Lane access management – status

- Ready for integration testing, but depends on infrastructure developments in SP3 Collaborative Dynamic Corridors
- Expected use by the SP3 Collaborative Dynamic Corridor application
- Expected use in the Gothenburg and Torino test sites

Driver performance assessment

- VDP vehicular signals processed
- Three evaluation algorithms developed:
 - Thresholding, k-nearest neighbours (supervised machine learning), Kohonen neural network (unsupervised learning)
- Instantaneous user feedback
 - Thresholding and k-nn
- Batch processing (about 1 min. windows)
 - Kohonen
- Sensor fusion of different parallel evaluators for an overall assessment

Driver performance assessment – status

- Tested on the basis of one Volvo truck recording and other synthetic data
- Extensive testing and consequent tuning is needed
 - Recordings are being collected in the Trento test site
 - Other recordings are needed from the other candidate test sites
- Work in progress
 - Integration of traffic and meteo data and speeding behaviour (when speed limit data is available)
- Expected use by the SG app

Data ingestion service

- Enable receiving, validating and recording contents generated by a community of users about mobility issues/conditions
 - (i.e. dangers, queues, car-parks, works)
- Validation is related to social-like applications: «confirmation carried out by the community about an information generated by a user»
- CSEs support a user community by changing the reputation of individual members through a proprietary validation mechanism
- Classification of community members in terms of their contribution to the community
 - A user reputation is increased or decreased on the basis of the number of confirmations / denials collected by his event notification

Data ingestion service – status

- Release & deployment of version 1.0 of Data Ingestion Service
- Release & deployment of Data Ingestion Service EFP customized features
- Tested in lab and in the field testing in the Turin integration test week
- Design of the Reputation evaluation algorithm customized for the EFP app
 - Customizations may be done for other apps on demand

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Enablers used by several DIALOGUE apps

- (1) HMI device provider
- (2) HMI proxy

HMI device provider

- Software module managing the Human-Machine Interaction on Android personal devices
- Presentation jobs are received from the HMI-Proxy enabler through a TCP Socket connection and decoded from XML for the actual presentation
- User feedback is encoded to JSON and sent to the HMI-Proxy

HMI device provider – status

- Planned to be used by several DIALOGUE apps in all the test sites
- General architecture, background services and connection to the HMI Proxy is implemented on Android
- GUI under development on the basis of the design mockups upcoming from the HMI group

HMI proxy

- The HMI-Proxy acts as a proxy for the applications to interact with the HMI
- The HMI_Proxy offers several OSGi services usable by the applications to inform the driver or get driver's feedback
 - Java APIs
- Presentation jobs are encoded to XML and sent to the HMI Device provider
- User feedback coming from the HMI device provider is decoded and handed over to relevant applications through Java API

HMI proxy – status

- Planned to be used by several DIALOGUE apps in all the test sites
- General Architecture implemented
- OSGi impl Bundle available
- OSGi API (necessary for implementing the apps' user interaction) under development on the basis of the HMI concept (upcoming from the HMI group)

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Cross-SP enablers

- (1) User registration
- (2) User data management
- (3) User authentication
- (4) Social networking (gaming)

Identity management

- Unique user identity management across all the TEAM apps
 - FLEX and DIALOGUE
- Includes three enablers
 - User registration
 - User authentication
 - User data management
- Implemented as webservices in the cloud

Identity management – Registration and user data management

- User creation
 - The TI CSE platform assigns a non modifiable OpenID URL
- Account management
 - Change password (user name is unique)
 - Un-register
- User profile management
 - Accessible by apps through the provided OpenID URL
 - App-specific profile customizations are possible
- <http://its.tilab.com/IdentityManager>

Identity management – Authentication

- Verification of claims about specific user identities
- The OpenID URL can be used by any TEAM application
 - OpenID 2.0 protocol for federated authentication
- Same access allowed also through credentials (username and password)
 - <http://its.tilab.com/IdentityAccess/OpenId>
- A REST-ful interface to the identity management server is also implemented for programmatic access
 - <https://its.tilab.com/IdentityManager/authenticate/user>

Identity management – status

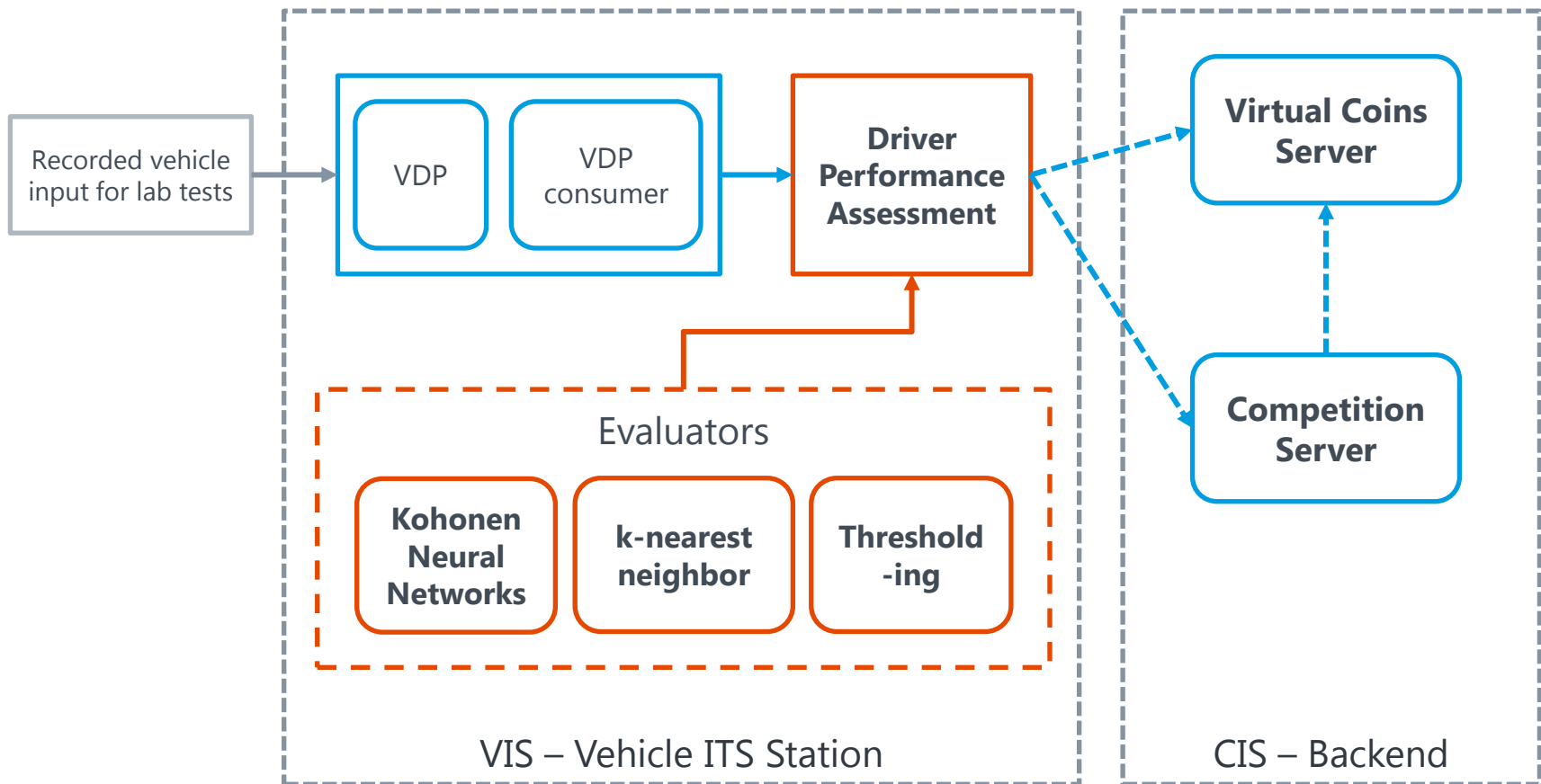
- Release & deployment of version 1.0 of User Registration functionality
- Rel. & dep. of version 1.0 of OpenID Authentication functionality
- Rel. & dep. of version 1.0 of REST Service Authentication functionality
- Rel. & dep. of version 1.0 and 1.1 of User Data Management functionality
- Field tested in the Turin Integration test week and within an SG-CB app prototype
- Cloud service usable by any app in any test site

Social networking for vehicles

- Focus on the innovative aspects of social gaming
- Separation of **performance** (Virtual Coins) and **comparison** (Competition)
- Virtuous cycle for acquiring (good performance) and spending VCs
- Periodic competitions in different areas, in different time frames
 - Self and social performance comparison and ranking
 - Usable by all TEAM apps (combined results)
- Badges
- Friendship and groups
- Service oriented architecture (REST web services in the cloud)

SP4 enablers - Demos

Social gaming prototype chain deployed (sample snapshot from the SG app)



SP4 enablers



Social networking for vehicles - status

- Release v1.0 available on the cloud
- Integration tests ongoing
- Interactions needed for organization of the test sites
 - Virtual coins expenditure
 - Competition apps, areas and timeframes

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TEAM collaborative modules outlook (I)

- Virtual Coins
 - Virtual bank for accumulating and spending coins
 - Cloud service usable by all TEAM apps (aggregated)
 - Game features (e.g., happy hours, bonuses, saturation)
 - Possible real-world rewards
- Competition Manager
 - Self and social comparisons (time and space-based)
 - Cloud service usable by all TEAM apps (can be aggregated in competitions)
 - Game features (Charts, performance meters, badges)
 - Feeds to the VC server

TEAM collaborative modules outlook (II)

- Driver performance assessment
 - SG Green drive / fluid driving (different algorithms, with sensor fusion)
 - Metrics defined for an objective assessment of the user/driver
 - Similar metrics in several TEAM apps
 - Feeds to the VC server and to the Competition manager
- Reputation Management
 - Part of SP4 Data Ingestion enabler
 - Cloud service usable by all TEAM apps
 - Subjective assessment (peer assessment of information provided)
 - Currently implemented for EFP. May be customized to other apps
 - Feeds to the VC server may be implemented

TEAM collaborative modules outlook (III)

- Traveler Profile and Trip Monitoring (SP2 TLPM component)
 - User preferences and profile storage
 - Information about trip data
 - Usable by different apps
- Local Dynamic Map++ (SP2 LDM++ component)
 - Storage and retrieval of dynamic information from different vehicles
 - Usable by different apps for collaboration-based suggestions (e.g. speed)

Thank you!

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